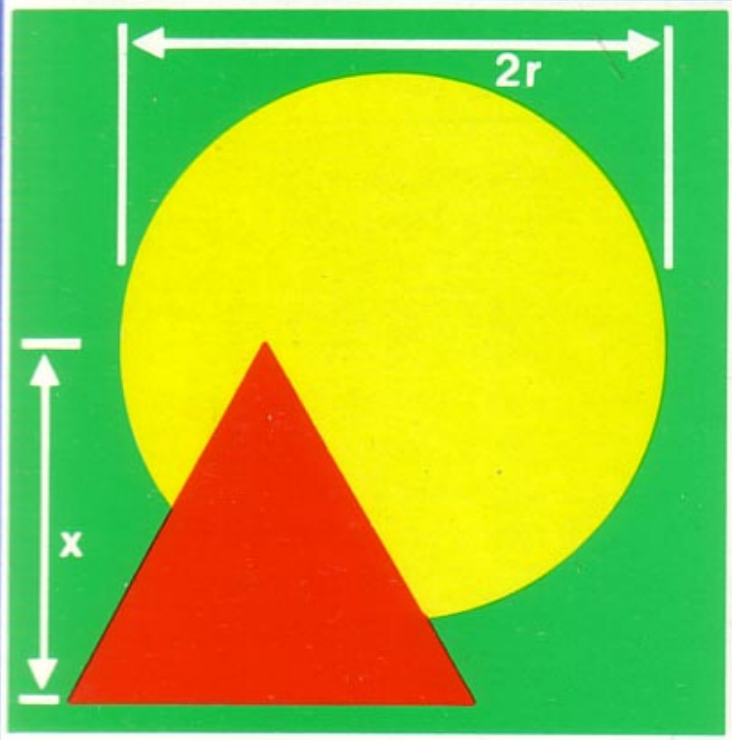
GRIFFIN SOFTWARE

Spectrum 48K

mathskills II

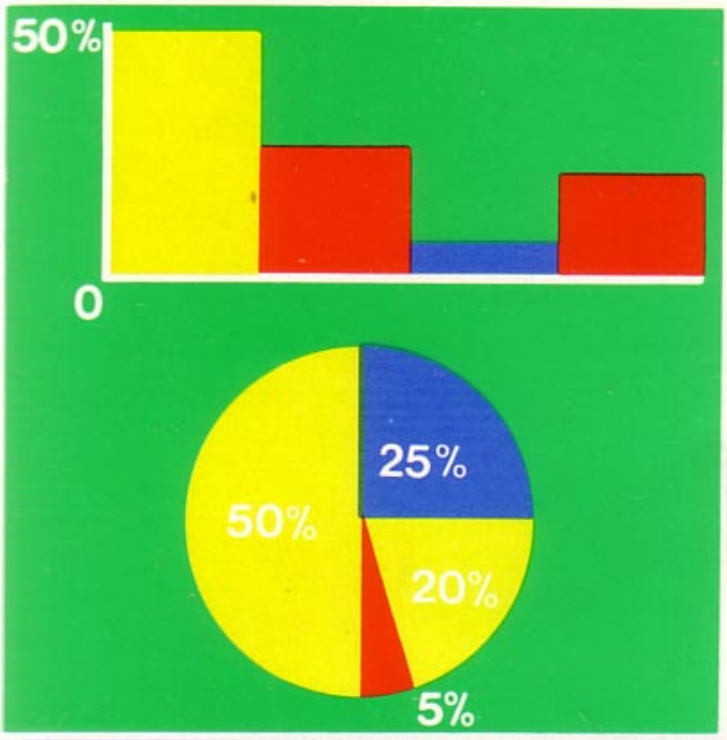


$z^2+6z+8=0$

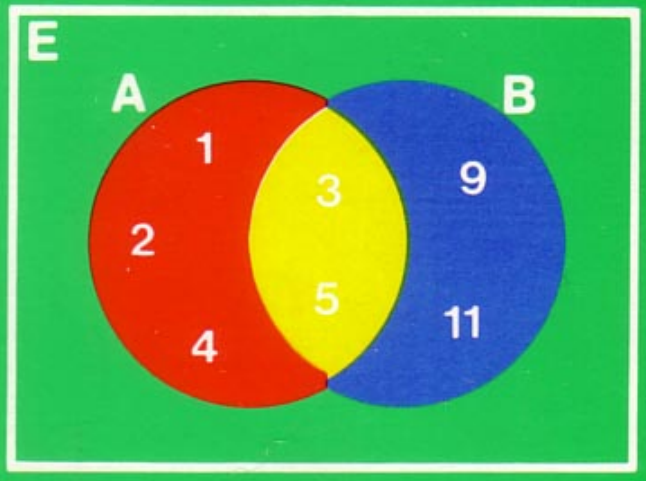
$\therefore (z+4)(z+2)=0$

$z=-4$ or -2. ✓

QED



A={1,2,3,4,5}
B={3,5,9,11}
E={All integers.}



EDUCATION AT LEISURE

CONTENTS

SECTION ONE: LOADING

Mathskills II is not just one program but a collection of four programs, each of which covers a different topic. This means that you can use each program individually and independent of the other programs on the tape.

The programs are recorded on the tape so that there are two on either side; 'Areas' is recorded first on side A, followed by 'Equations'. 'Percent' is recorded first on side B, then 'Sets'. It is a good idea to make a note at the back of this book of the tape count where each of the programs start, so that you don't have to search through the whole tape to find the beginning of the program you want.

The filenames of the programs are listed below. To load a specific program type 'LOAD "xxx"', where 'xxx' is the filename of the program you want. Make sure that the tape is on the correct side and at the correct place, then press 'ENTER' and play the tape. For further information refer to Sinclair's manual, chapter twenty.

PROGRAM NAME	FILENAME	SIDE OF TAPE
Areas and perimeters	areas	A
Simple equations	equations	A
Percentages	percentage	B
Sets and Venn diagrams	sets	B

NOTE: All filenames are in lower case letters.

All the programs are recorded to the best possible quality. However problems can occur if the volume level is too high or too low. The best setting is at about ½ to ⅔ of the maximum volume of most domestic cassette recorders. If a tone setting is available it should be set to maximum treble.

During loading the Griffin software logo will be displayed. This is a good indication of whether the program is loading successfully. See fig. 1.1.

FIG. 1.1

SECTION TWO: AREAS

"Areas and Perimeters" is a program designed to teach methods of calculating areas and perimeters of simple shapes. The shapes used by the program include squares, triangles, parallelograms and many more.

When the program has loaded you will be asked to type in your name. It must contain more than one letter but less than fifteen. All you have to do is type it in and press the 'ENTER' key. Next you will be asked to type in the date. This can take any form, either letters or numbers, but it must have less than fifteen characters. If you give an invalid reply to either of these questions you will be asked to re-type the information.

You will then be asked what type of questions you want. You can either have questions on areas or perimeters. Pressing **'1'** will give you questions on areas, pressing **'2'** will give you questions on perimeters. Each option is described more fully later in this section.

The prompt "Instructions? y or n" will appear in the middle of the screen. Pressing **'Y'** will display pages of text showing the formula you will need to know and give examples of the type of questions you may be asked. When you have finished reading a particular page you should press the **'ENTER'** key and the next page will be displayed. However, pressing **'N'** will send you straight into the questions.

QUESTIONS ON AREAS (OPTION NUMBER ONE)

All these questions are based on the area of simple shapes. The computer will display the shape and all the measurements you will need. The shapes are not necessarily drawn to scale, as this would give too much away. An example question is shown in fig. 2.1.

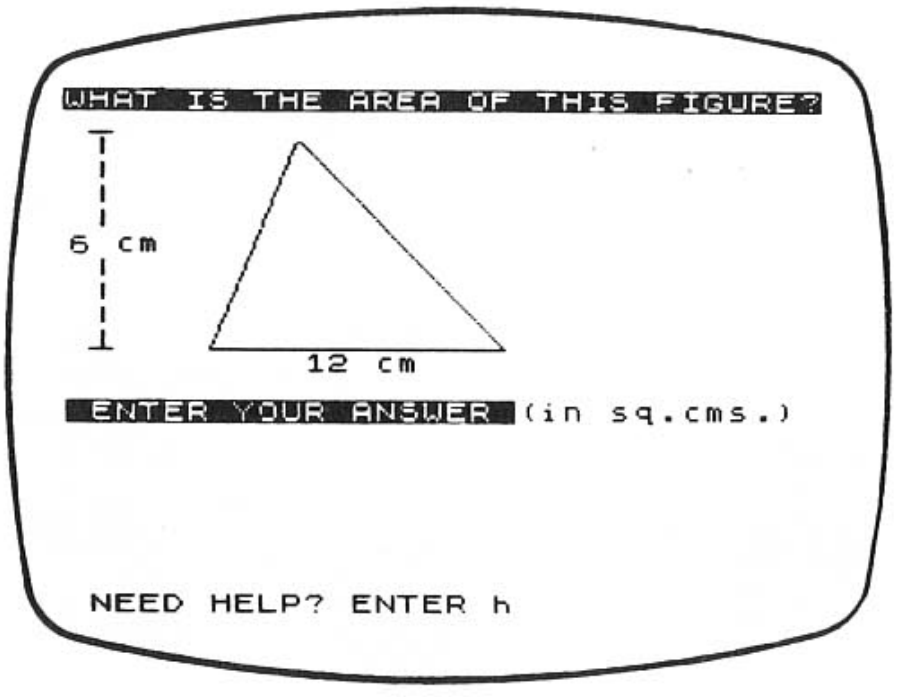


FIG. 2.1

As you can see, all measurements are in centimetres and it is assumed that your answer is in square centimetres. You should never enter the units as part of your answer.

Therefore, in fig. 2.1 you would type **'36'** and press the **'ENTER'** key. Since the answer is correct the words "Well done" will appear in the middle of the screen. If you do not know the answer to a particular question then you can do two things; you can answer the question wrong, be told the right answer and then go on to another; or you can press **'H'** and then **'ENTER'** and be told the formula you should use. See fig. 2.2.

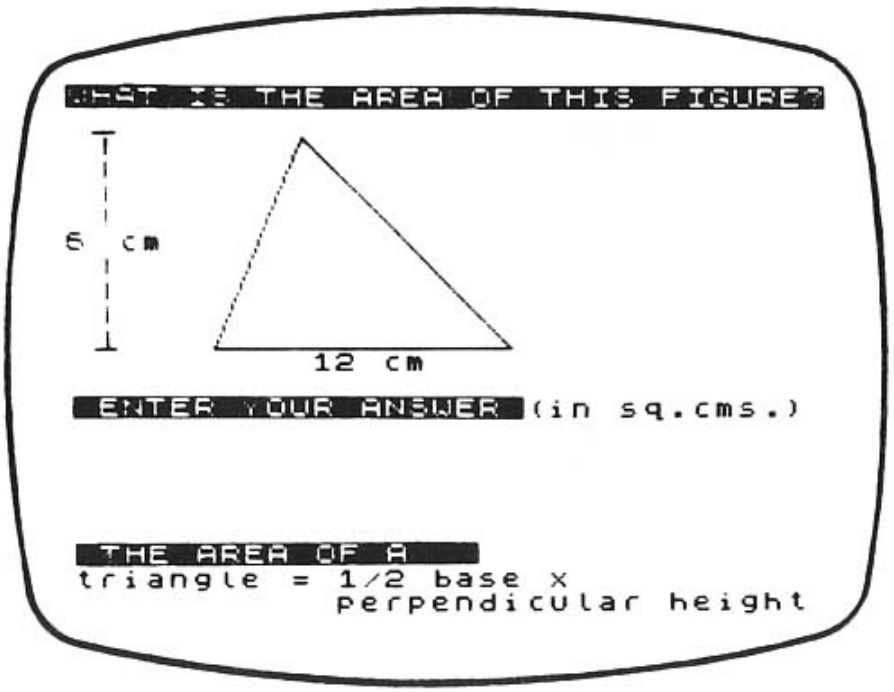


Fig. 2.2

You will note that the relevant formula is displayed at the bottom of the screen. The flashing **'L'** at the bottom left hand corner is there to tell you that you have to re-enter your answer. You must always remember to press the **'ENTER'** key at the end of your answer.

After you have answered a question you will be told your current score and the prompt "More? y or n" will appear at the bottom of the screen. This is asking you whether you want another question or not. Pressing **'Y'** will give you another question on the same topic; but pressing **'N'** will print out your certificate (see section seven) and ask you if the same person wants to use the program again. You should press **'N'** for no or **'Y'** for yes. If you reply no the new user will be asked to enter their name as described earlier, and the program will continue as before.

QUESTIONS ON PERIMETERS (OPTION NUMBER TWO)

These questions are based on the perimeters of simple shapes. The computer will display the shape and all the measurements you will need.

All measurements are given in centimetres and it is assumed that your answer is in centimetres. For the purposes of this program you should assume that all the shapes are symmetrical about either a horizontal or vertical axis, except for parallelograms and L-shapes. An example question is given in fig. 2.3.

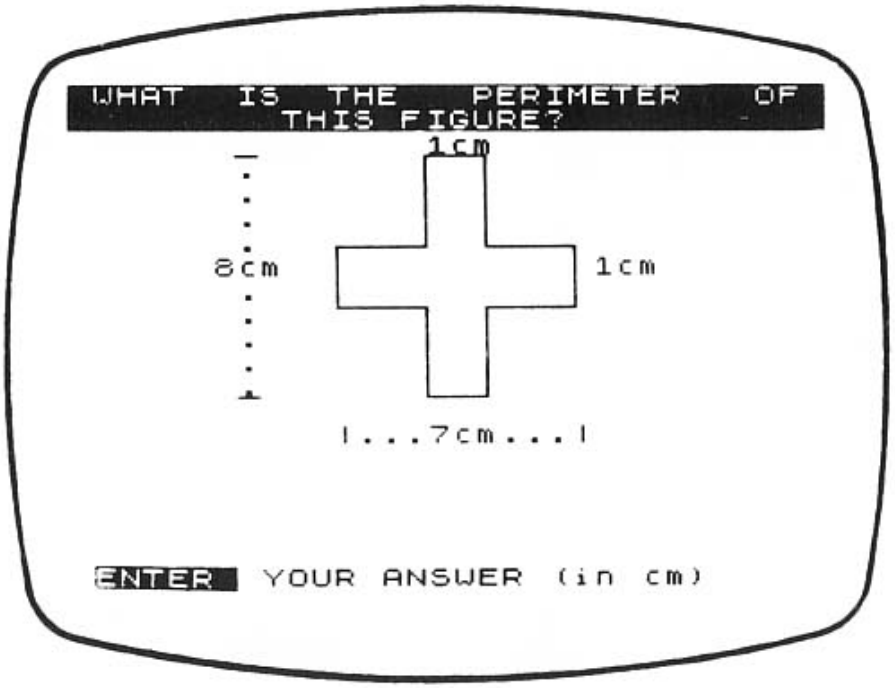


Fig. 2.3

You should calculate the perimeter and type in your answer followed by the **'ENTER'** key. After typing in your answer you will be told whether it is right or wrong. If your answer is wrong then the correct answer will be displayed. It should be noted here that the units are not displayed as they are always assumed to be centimetres. Your current score will also be displayed along with the prompt "More? y or n", if you answer yes (press **'Y'**) then you will be given another question. If you answer no (press **'N'**) then your certificate will be printed (see section seven) and you will be asked if the same person is going to use the program again. If you answer no (press **'N'**) then the new user will be asked to enter their name and the program will start again from the beginning.

QUESTIONS USING Pi

As you may know Pi is the ratio of the circumference of a circle to the diameter and is approximately 3.1416, correct to four decimal places. In some of the perimeter questions that involve circles you may need to use Pi. However, you do not need to enter this as a number as it is already on the Spectrum keyboard. To obtain Pi all you have to do is hold down **'CAPS SHIFT'** and press **'SYMBOL SHIFT'**, then release both keys and press **'M'**. You will notice that the **'M'** key has **Pi** printed above it in green.

Look at the example in fig. 2.4 that requires the value Pi:

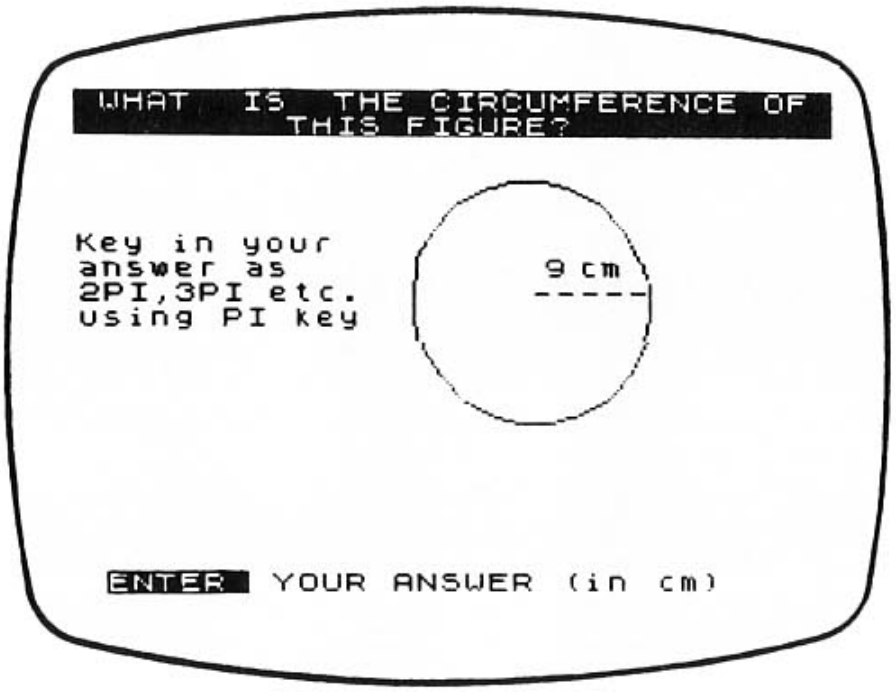


Fig. 2.4

Using the formula:

Circumference=2 × Pi × radius,

you can calculate that the circumference is 18×Pi, therefore you should type "**18Pi**" then the '**ENTER**' key. Pi is obtained as described above.

SECTION THREE: EQUATIONS

"Simple Equations" is a program designed to teach an approach to solving simple equations with one unknown variable. One of the unique features of this program is that it provides complete formally written solutions, the sort which have to be reproduced in examinations.

When the program has loaded you will be asked to type in your name, it must have more than one letter and less than fifteen. Next you will be asked to enter today's date. It can be in any form, either letters or numbers. If you do not feel it necessary to enter the date then you can just press '**ENTER**'. Please remember that whatever you type in response to these questions must be followed by the '**ENTER**' key.

You will now be asked whether you want instructions. The instructions provide a written introduction to simple equations and also contain several examples. When you have read each page press the '**ENTER**' key and the next page will be displayed. After the last page has been displayed the message "Press **ENTER** to start" will be given, which means that when you press '**ENTER**' your first question will be given.

An example question is shown in fig. 3.1.

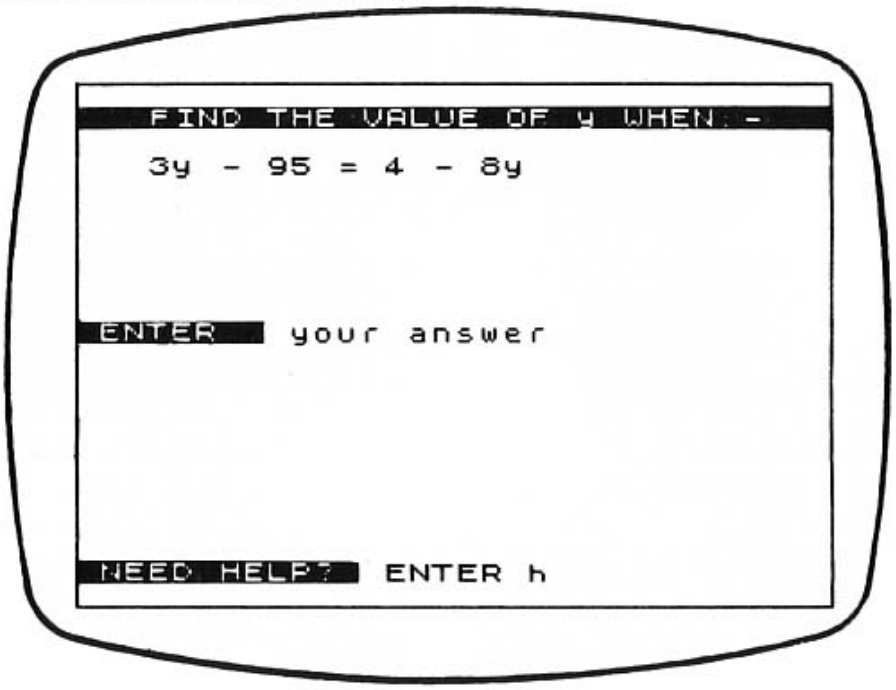


Fig. 3.1

You should calculate the numerical value of the unknown variable and type it in followed by **'ENTER'**. If you are unable to answer a particular question then just press **'ENTER'**. You will be told whether your answer was right or wrong and if it was wrong the prompt "Press ENTER and check with me" will appear at the bottom of the screen; after pressing **'ENTER'** a complete solution will be displayed.

Your current score will be displayed after each question and the prompt "More? y or n"; if you reply yes (press **'Y'**) then you will be given another question. If you answer no (press **'N'**) then your certificate will be printed (see section seven) and the message "Another go? (y/n)" will appear. If you press **'N'** the program will end, if you press **'Y'** the prompt "Same person? y or n" will appear. You should press **'N'** if someone else is going to use the program, otherwise press **'Y'**. Obviously if you press **'N'** then the new user will be asked to enter their name, and the program will start again.

An example of the sort of approach you should use when answering these questions is given below:

Solve: $3y - 42 = 6 - 5y$

Get the terms containing y on the same side of the equals sign. Remember the rule, "a change of side means a change of sign".

Therefore we get: $3y - 42 + 5y = 6$

Now apply the same rule to get all the numbers on the same side.

Therefore: $3y + 5y = 6 + 42$

Add up the two sides to get: $8y = 48$

Now divide both sides by eight.

Therefore: $y = 6$

For a final check put the value six back in the original equation and check that it works:

$$(3 \times 6) - 42 = 6 - (5 \times 6)$$
$$\Rightarrow \quad 18 - 42 = 6 - 30$$
$$\Rightarrow \quad -24 = -24 \qquad \text{which is true.}$$

SECTION FOUR: PERCENTAGE

"Percentages" is a program designed to teach the ideas of percentage representation. This program is very versatile, in so much that it not only teaches methods of converting from fractions to percentages and vice-versa, but also introduces methods of calculating percentages of whole numbers.

After loading the program you will be asked to type in your name. It must have more than one letter and less than fifteen. Next you will be asked to enter the date. This can be in any form, using either letters or numbers, but again it must contain no more than fifteen characters and more than one. An invalid response to any of the above questions will mean that you will have to re-type your entry. Please remember that whatever you type in response to these questions must be followed by the **'ENTER'** key.

You will now be asked whether you want instructions. Press either **'Y'** for yes or **'N'** for no. The instructions contain all the information and examples you will need to be able to attempt all the questions presented by this program. They are displayed one page at a time. To advance to the next page press the **'ENTER'** key. There are a total of four pages of instructions. When you press **'ENTER'** after the last page your first question will be displayed. An example question is given in fig. 4.1.

All the questions have the same format as the one shown. That is, they all have the question displayed at the top of the screen and the format that the answer should be in at the middle. You will notice that the block at the bottom right of the screen tells you which key to press if you need help; this will be discussed in more detail later.

There are, as was said earlier, several different types of question contained in this program, so the best idea is to take each type in turn. We will start with the percentage to fraction conversion questions. These questions obviously require the answer to be entered in the form of a fraction.

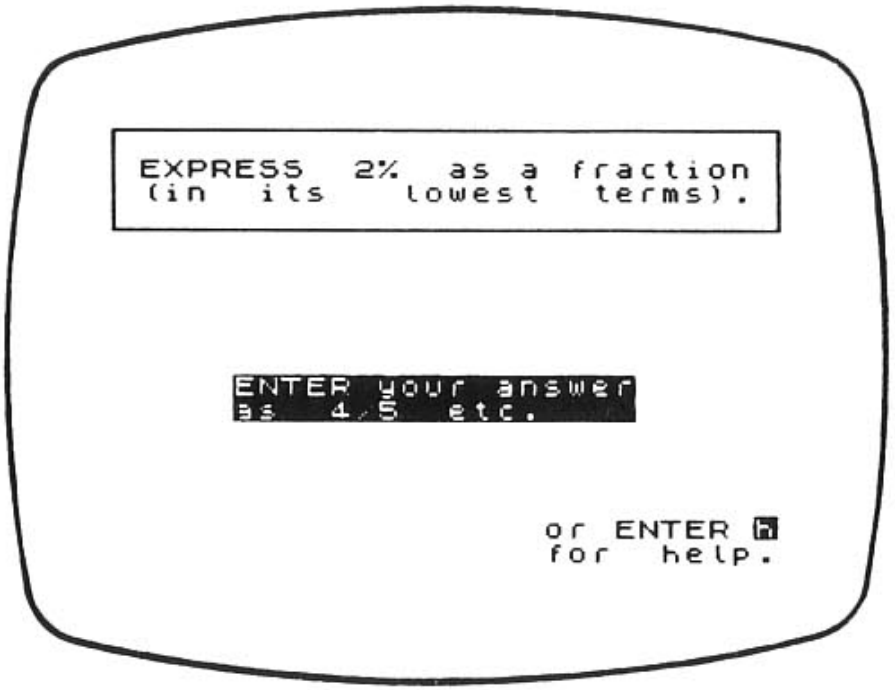


Fig. 4.1

This is done by typing in the top number of the fraction first, followed by a slash. The slash sign is obtained by holding down 'SYMBOL SHIFT' and pressing 'V' (you will see the sign printed in red on the 'V' key). Now type in the bottom number of the fraction. Figure 4.2 shows an example of this type of question:

This is only a very simple example and the answer is obviously 1/25 so you would type in the answer as "1/25", press 'ENTER' and the words "WELL DONE" will appear under the question. If your answer was wrong then the words "SORRY – let's check" would appear under the question and a complete solution would be given.

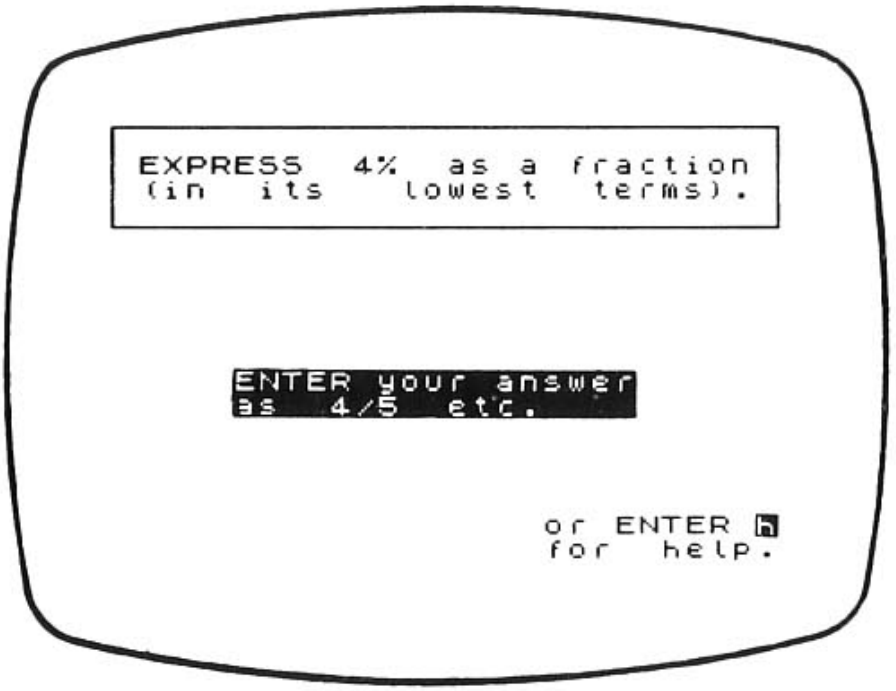


Fig. 4.2

The next type of question, is the fraction to percentage conversion. An example is shown in fig. 4.3.

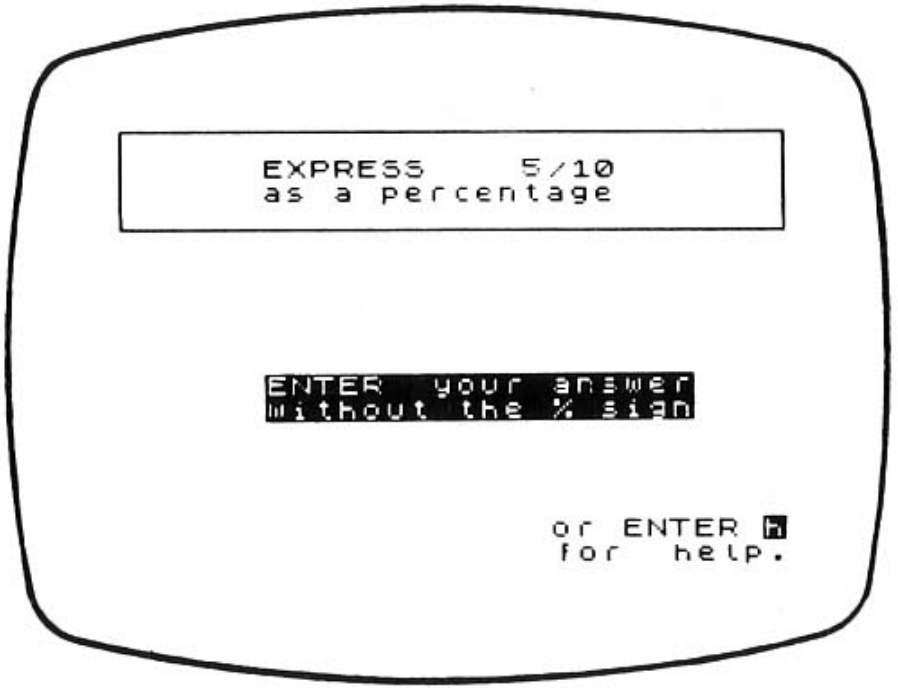


Fig. 4.3

In this example the answer is, of course, 50%. However you never need to enter the percentage sign, so you would type "50" and press the 'ENTER' key. The computer will then print the relevant message depending upon whether your answer is correct or not.

The next type of questions are the ones that ask you to calculate a percentage of a whole number. Look at the example in fig. 4.4.

The answer is just going to be a number, so you should type it in and press the 'ENTER' key. The computer will again reply with the relevant message.

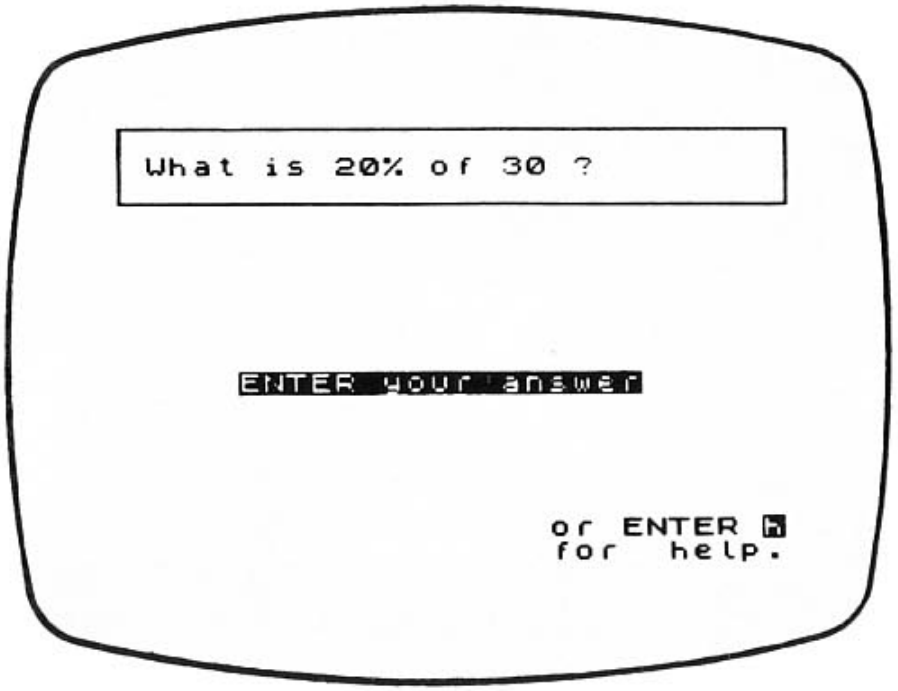


Fig. 4.4

The final type of question you may get asked is the type whereby you are asked to express one number as a percentage of another. (See fig. 4.5).

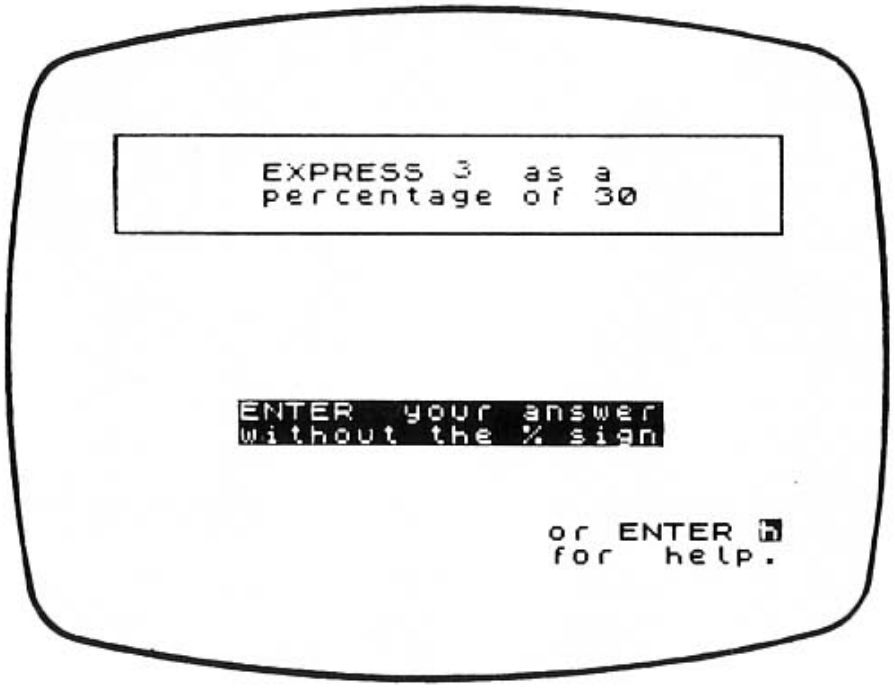


Fig. 4.5

The answer is going to be a percentage, but you should not type in the percentage sign, just the numbers. So for this example you would type "10" (since the answer is 10%) and press the 'ENTER' key. The relevant reply will then be displayed under the question.

As you have probably noticed all the examples above have displayed the message "or ENTER h for help". This is there to remind you that if you ever get stuck with a question you can press 'H' followed by 'ENTER' and a set of instructions, telling you exactly what to do will be displayed underneath the question. An example of the help you would get if you had pressed 'H', in response to the question above, is given in fig. 4.6.

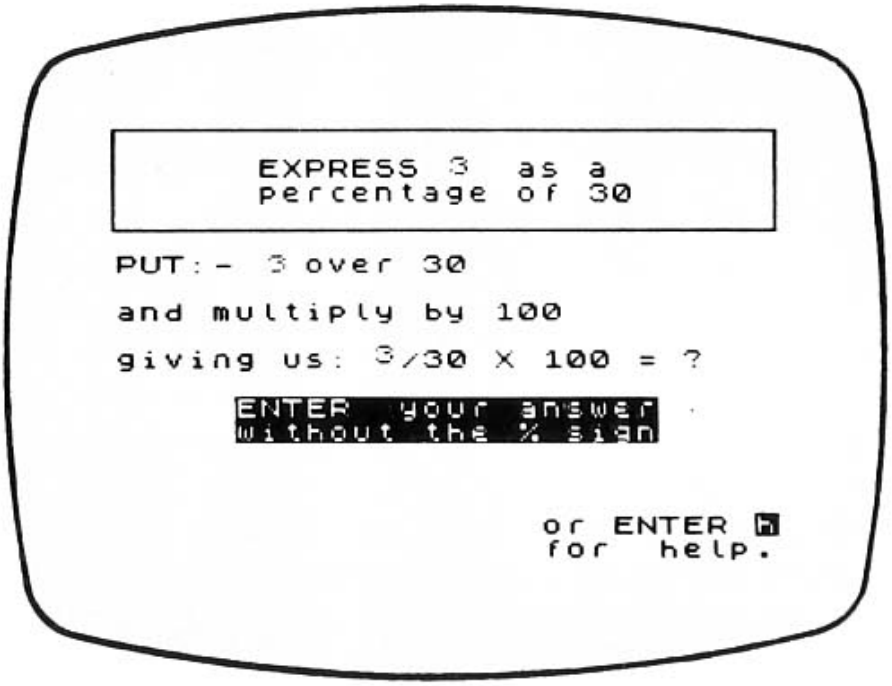


Fig. 4.6

At the end of each question the prompt "More? y/n" will appear at the bottom of the screen. This is asking you whether you want another question or not. If you answer yes (press **'Y'**) then you will be given another question; if you answer no (press **'N'**) then your certificate will be printed (see section seven) and you will be asked if you want another go. Replying no will end the program, but replying yes will ask you if the same person wants to use the program again. If you reply no then the new user will be asked to enter their name and the program will start again from the beginning.

SECTION FIVE: SETS

"Sets and Venn diagrams" is a program designed to introduce set theory and to demonstrate the uses of Venn diagrams. The three major set manipulation functions are used by this program, namely union, intersection and subset.

After loading you will be asked to type in your name. It must have between two and fifteen letters (remember to press **'ENTER'** at the end). Next you will be asked to enter the date. It can take any form, either letters or numbers, but must also have between two and fifteen letters and must be followed by the **'ENTER'** key.

Next you will be asked what type of questions you want. You can have questions that just involve set theory (by pressing **'1'**) or questions that involve Venn diagrams (by pressing **'2'**). Each type of question is described more fully below.

No matter what type of question you choose you will be given the option of having instructions displayed or not. These instructions act as an introduction to the chosen topic, and also give examples and any formulae you may need to solve the questions.

If you choose to read the instruction pages press **'Y'** in response to the prompt "Instructions? y/n", if not type **'N'**. The instructions are displayed one page at a time, to advance to the next page press the **'ENTER'** key.

QUESTIONS ON SETS (OPTION NUMBER ONE)

Two sets are displayed at the top of the screen and these sets are different with every question. Underneath these is the actual question. In this case you are asked to work out 'A union B' (where A and B are the sets defined at the top of the screen). Next are four options, only one of which is the resulting set of the function AuB. In this example the answer is the set [1,6,7,8], which is option two, so you should press **'2'**. If the answer is correct then the words "WELL DONE!" will appear in the middle of the screen. If you enter a wrong answer the words "BAD LUCK correct ans. is", and the correct answer will appear.

A typical question from this section is shown in fig. 5.1.

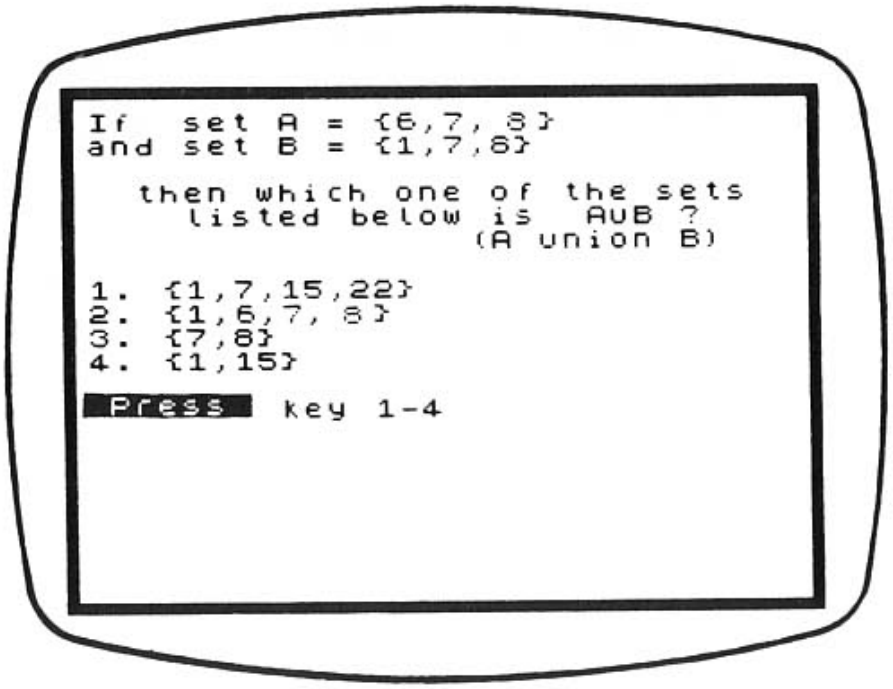


FIG. 5.1

This is only one example question and there are many more different types in the program, but they all have four possible answers and all you have to do is press the number that corresponds to the correct answer. If you are unable to answer a particular question then just guess the answer and then later have a look at the instruction pages and you will find that they explain what you need to know clearly and simply.

At the end of each question your current score will be displayed and the message "More? (y/n)" will appear. If you answer yes (by pressing 'Y') you will be given another question. If you answer no (by pressing 'N') your certificate will be printed and you will be asked if the same person wants to use the program again. Press either 'Y' for yes or 'N' for no. If you answer no then the new user will be asked to enter their name, and the program will start from the beginning again.

QUESTIONS ON VENN DIAGRAMS (OPTION NUMBER TWO)

These questions introduce the use of Venn diagrams to show set functions such as union, intersection and subset. In a Venn diagram the universal set is contained within the rectangular box. The other sets are shown as circular shapes. Each circle is labelled with a letter to indicate which set it represents. For the purposes of this program only two sets are used, each labelled with a single letter. You must assume that the universal set is defined as the set of all REAL integers. IT IS STRONGLY RECOMMENDED THAT THE INSTRUCTIONS THAT ARE CONTAINED IN THIS PROGRAM ARE READ BEFORE ATTEMPTING TO ANSWER THE QUESTIONS. To obtain the instructions just press 'Y' in response to the

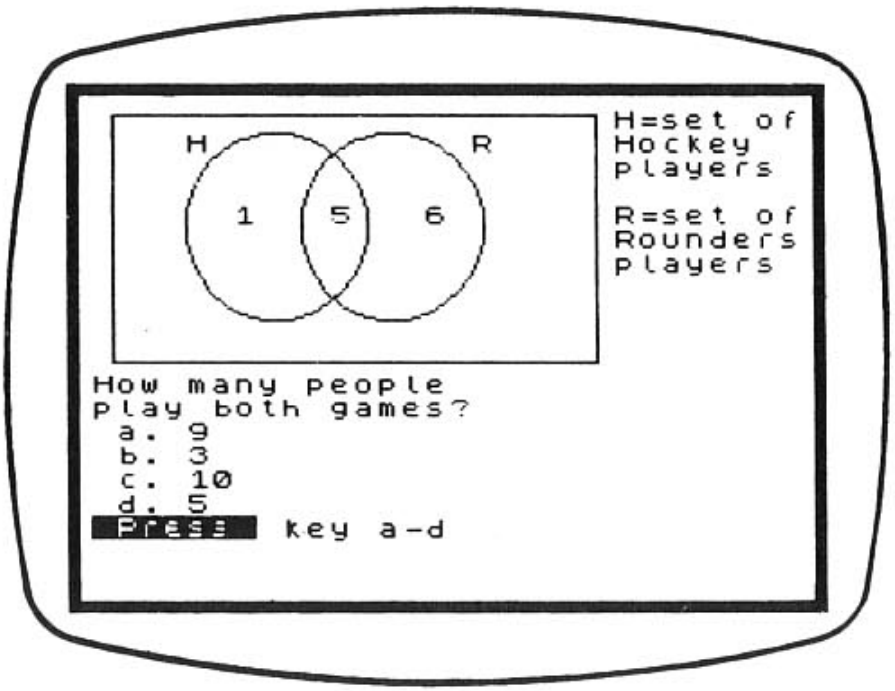


Fig. 5.2

question "Instructions? (y/n)", otherwise press 'N' and go straight into the questions.

The questions in this section all have the same format. A Venn diagram is displayed at the top of the screen and the sets used in it are defined on the left. The question is displayed in the middle of the screen and four different answers underneath it. An example question is given in fig. 5.2.

The question asks how many people play both games. This would be expressed as the set 'H intersection R', which, on the Venn diagram is the area where the two circles overlap. The number in this area is five, therefore the number of people that play both games is five, which is answer d. Thus you would press 'D' and the words "WELL DONE" will appear along with the correct set notation for your answer.

Your current score will now be displayed and the prompt "More? y/n" will appear at the bottom right of the screen. This is asking you whether you want another question or not on the same topic. If you answer yes (press 'Y') then you will be given another question. If you answer no (press 'N'), your certificate will be printed (see section seven) and you will be asked if the same person wants to use the program again. You should press 'Y' for yes or 'N' for no. If you answer no then the new user will be asked to enter their name and then the program will start again from the beginning.

SECTION SIX: PLAYING THE GAMES

Every program on the Mathskills II tape has a different game built into it. In fact, the programs "Areas" and "Sets" have two totally different games in them.

All the games are basically the same but have different scenarios. For example, in the "Percentages" program you have to score a goal. This is done by getting five consecutive questions correct. In fact, each time you get a question correct you get nearer to completing the game; each time you get one wrong you get further away. Therefore, the fastest possible way to complete a game is to get the first five consecutive questions correct. Below is a quick description of the games in each program.

AREAS AND PERIMETERS:

(i) Areas Questions: You have to get the runner to the finishing line. Each time you get an answer right he moves closer, but gets further away when you get a question wrong.

(ii) Perimeters Questions: In this game you have to play snooker, and pot the red ball. Each time you get an answer right the white ball is hit harder.

SIMPLE EQUATIONS: All you have to do here is get the caterpillar to the food before it dies. The more consecutive questions you get right the longer the caterpillar lives.

PERCENTAGES: In this game all you have to do is score a goal. The more consecutive questions you get right, the harder the player will kick the ball.

SETS & VENN DIAGRAMS:

(i) Sets: With this game you have to hit the bulls-eye of the target. The arrow will get nearer each time you get an answer right, and further away when you get an answer wrong.

(ii) Venn Diagrams: In this game you have to get your horse to win the race. It will get closer to winning each time you get a question right, but further away each time you get one wrong.

SECTION SEVEN: THE CERTIFICATES

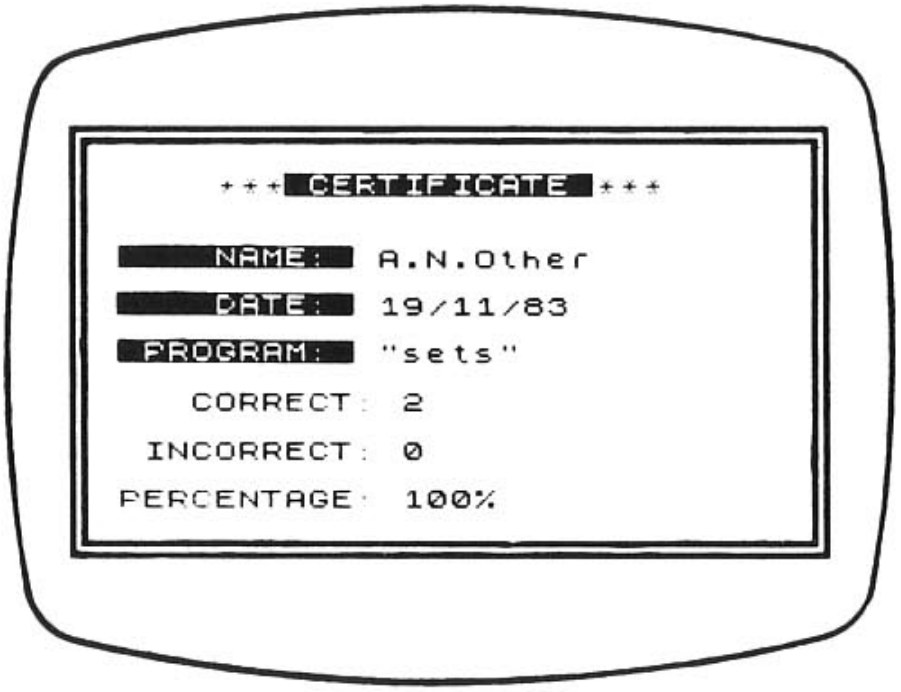


FIG. 7.1

Every program on the Mathskills II tape prints certificates that contain data telling you how well you coped with the questions. An example certificate is shown in fig. 7.1.

As you can see the certificates tell you how many questions you got right, wrong and your overall percentage. This data can be used to examine your progress over a period of time, or to point out your weak subjects.

All the certificates will be printed on a ZX printer if one is connected. If one is not available they will just be displayed on the screen.

SECTION EIGHT: SPECIAL NOTES

This section is provided for notes that cannot be placed anywhere else in this booklet.

(i) The 'BREAK' key.

Do not at any time while using a program press the 'BREAK' key, as this will result in the program needing to be re-started, thus losing all information currently held in the computer. In certain circumstances you may find that a program will not re-run after the 'BREAK' key has been pressed. This will mean that the program must be loaded again from tape.

(ii) A word about input and the 'ENTER' key.

The programs in Mathskills II require the user to enter information. For example, the answer to a question, or the solution to a particular problem. Reading the documentation will answer most of the questions, but here are a few guidelines that will make sense of most of the situations.

(a) If the question or prompt, has something like "(y/n)" at the end it means that the answer is simply yes or no. You should press the **'Y'** key if you want to answer yes, or the **'N'** key if you want to answer no. For these sort of replies the **'ENTER'** key is not needed.

(b) If the question contains the word "enter" in capitals, for example "ENTER your answer", it means that whatever you type should be followed by the **'ENTER'** key. If this is the case you will see a flashing **'L'** at the bottom left hand corner of the screen.

(c) If you are given a list of options, you will usually find that there is a letter or number on the left hand side. To make your choice you should press the letter or number that is next to the option you want. Replies like this should never be followed by the **'ENTER'** key.

(d) If the message "Press any key" or similar appears, it means just that, but you should never use the **'BREAK'** key.

INTRODUCTION

Mathskills II is a suite of programs designed for students in the ten to fifteen year age range. The four programs cover six important areas of almost any 'O' level syllabus, namely areas, perimeters, simple equations, percentages, sets and Venn diagrams.

All the programs in Mathskills II contain a special "help key" which can be used by the student when he or she either can't remember a formula, or can't remember how to approach a certain type of question. This makes use of the idea that the student will learn by his or her mistakes, and has been found to be very effective.

The first program, called "Areas" introduces the student to areas and perimeters of simple shapes, such as triangles, squares and parallelograms. The program contains fully documented instructions on both topics and lists all the standard formulae the student may need. This program not only teaches methods of solving these types of problems but also encourages the student to develop his or her own ideas and methods.

Next a program called "Equations" develops the student's understanding of simple equations with one unknown variable. One of the many features of this program is that it not only tells the student whether his or her answer was right or wrong but also gives formally written solutions, which of course the student would have to reproduce in an examination.

Thirdly, "Percent", a program which, as its name suggests, introduces the student to fractions in percentage form. Along with its many other features this program contains questions and solutions on fraction to percentage conversions and vice-versa, and percentages of whole numbers. Again this program provides formally written examples and explanations.

Lastly a program called "Sets" which covers a wide spectrum of ideas based upon set theory. The program demonstrates the three major set manipulation functions union, intersection and subset; and also introduces Venn diagrams to demonstrate set manipulation. All the examples used in this program only refer to two finite sets and a pre-defined universal set.

All the programs in this suite drive the ZX Printer. However the programs will not be affected in any way if one is not available. For instructions on the use and installation of the printer refer to Sinclair's own manual.

This package was designed and tested in collaboration with teachers and has been found to be interesting and informative. You will find it a useful, if not essential, part of an 'O' level course.

The range of educational software available from Griffin Software is continually being revised and improved. For further details please write to:
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